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(58) Field of Search

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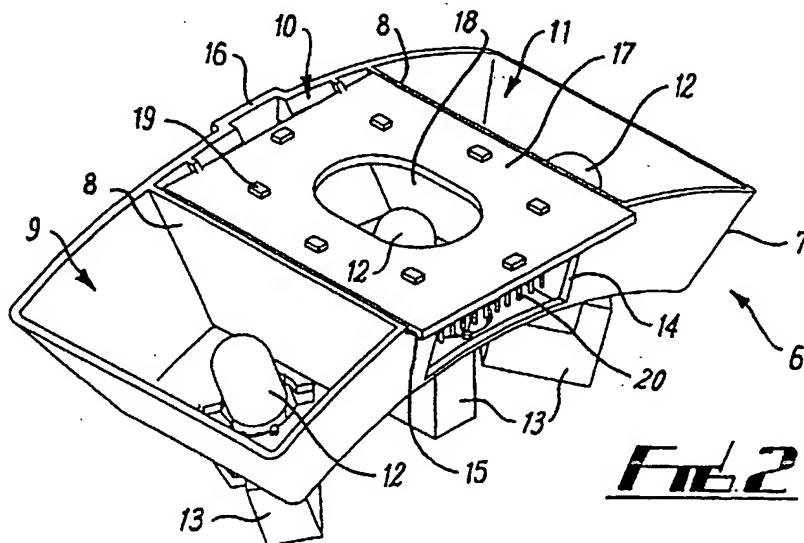
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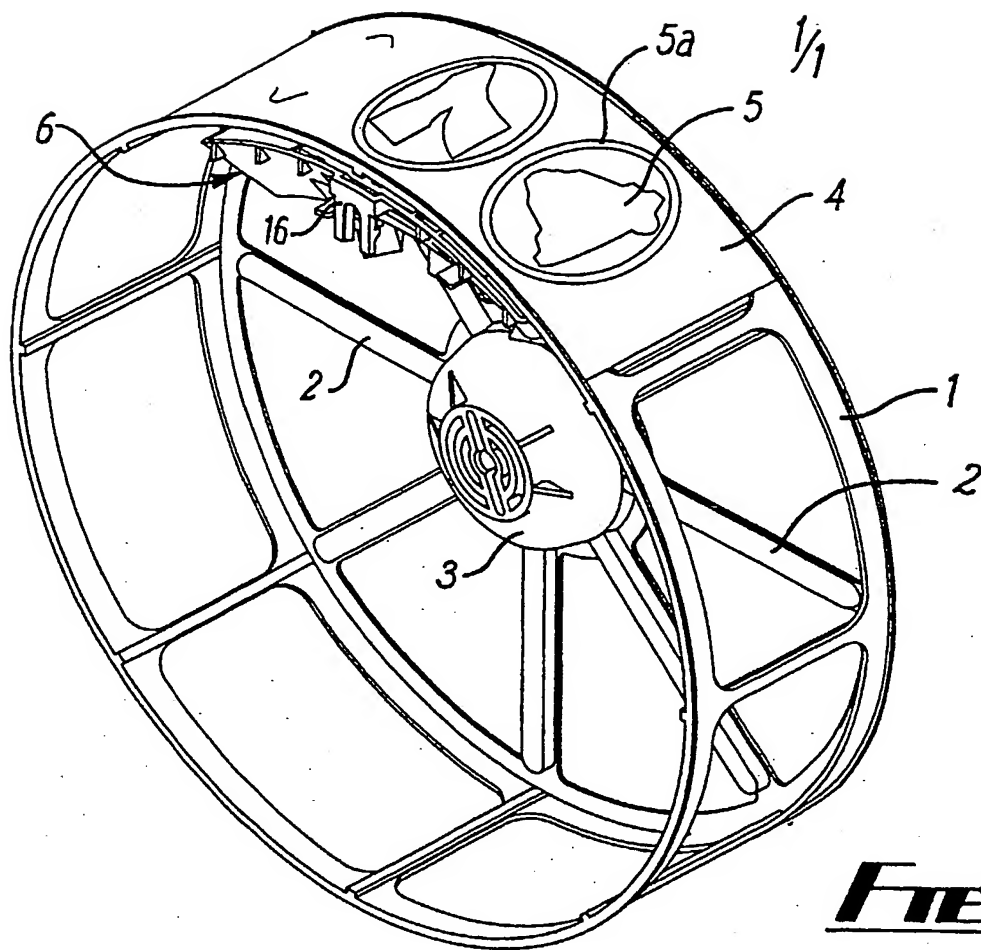
(54) Abstract Title

**Back-lit Symbol with Variable Colour Lighting of Symbol Periphery**

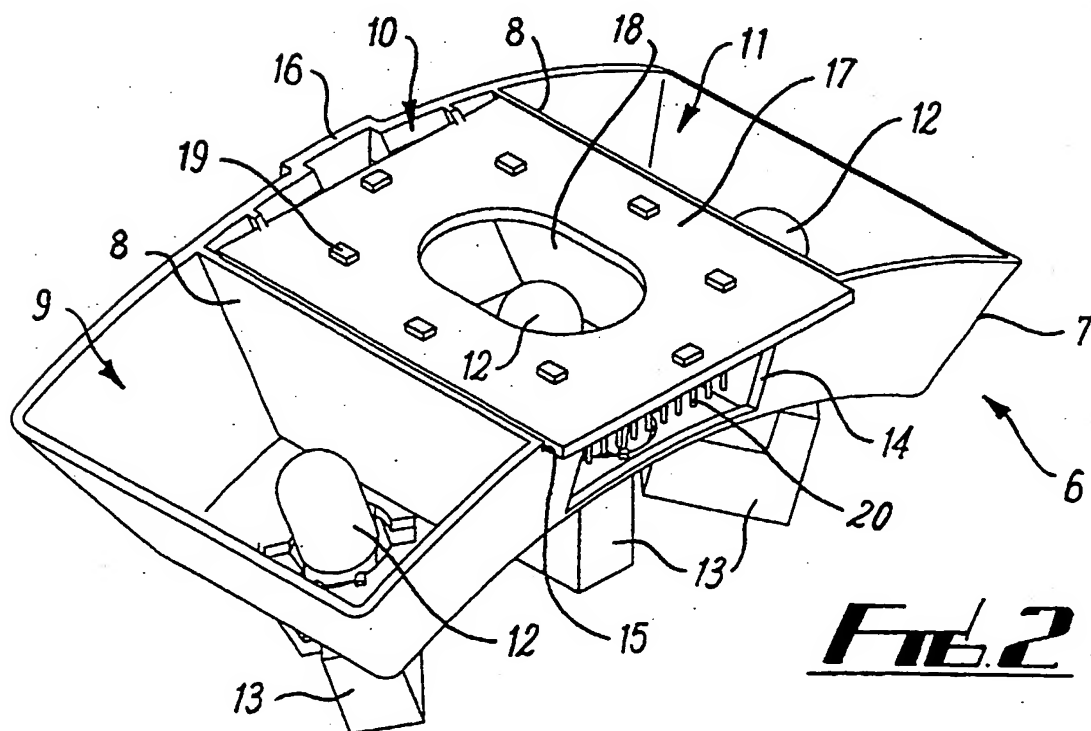
(57) An illumination device 7 has back-lighting of a light transmitting structure (4) comprising one or more light sources 12 surrounded by colour-variable light sources 19, such as tri-colour LEDs, physically arranged to illuminate the periphery (5a) of the symbol (5). Preferably the device is used to illuminate reels in a fruit machine.



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**FIG. 1**



**FIG. 2**

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ILLUMINATION DEVICE FOR SYMBOL DISPLAY

This invention relates to an illumination device for symbol display equipment, particularly for a player-operable entertainment machine.

Player operable entertainment machines of the 'fruit' or 'poker' kind  
5 have a main display device for displaying a selected combination of symbols at a win zone.

This main display device may comprise an assembly of multiple side by side symbol-bearing reels which are rotatable about a common horizontal axis mounted within a housing behind a window in a printed glass panel.  
10 Typically, each reel is a drum-shaped skeleton structure with a translucent flexible band printed with symbols at say 20 positions around its periphery. Within the reel there is a static light box which back-illuminates one or more of the symbols at the win zone. Usually three symbols on each reel (when at rest) are displayed at the win zone and may be back illuminated: a central  
15 symbol on a horizontal win line and two other symbols respectively above and below the central symbol.

With this known arrangement, the light box, indexed rotation and stopping of the reel, and the positioning of the reel band all have to be carefully set to ensure proper registration of symbols with the win line and  
20 with the back illumination. Any inaccuracy in this could give rise to uncertainty as to whether or not a winning symbol or combination of symbols is in fact selected.

Moreover, with this known arrangement, the number of combinations is limited by the number of symbols which can be displayed simultaneously which is typically three symbols for each reel. With a view to increasing the number of combinations, GB 2336233-A proposes backlighting the symbols with different light colours instead of using only white light. However, the symbols are typically multicoloured to give an attractive display and this raises problems in that colour backlighting can undesirably conflict with the symbol colours.

An object of the present invention is to provide an illumination device which can be conveniently aligned or registered with displayed symbols and which can be used to provide different illumination effects in a convenient and attractive manner.

According to one aspect of the invention therefore there is provided an illumination device for symbol display equipment comprising at least one source of illumination arranged to be mounted behind a light-transmitting structure bearing at least one symbol to provide back-illumination therefor, characterised in that at least one said source of illumination comprises a colour-variable boundary illumination source to provide back illumination at least partially around the periphery of at least one said symbol.

With this arrangement, the use of a boundary source of illumination has the advantage that it need not adversely conflict visually with the symbol irrespective of the respective colours of the symbol and the

boundary source, since the boundary source does not have to overlap or directly backlight the symbol itself. A wide range of different colours can therefore be conveniently used for the boundary source as desired.

Moreover, the use of a boundary source facilitates alignment or registration in so far as it can be readily seen on which symbol the source is centred even if it is off-centre or slightly misaligned.

Preferably the (or each) boundary source is provided in combination with a backlight illumination source which may be a white light lamp or any other suitable light source of any desired colour. In this case the backlight source may be located within the boundary source i.e. such that the boundary source extends around at least part of the periphery of the zone of illumination of the backlight source.

Conveniently the (or each) boundary source may be formed from a plurality of individual lighting elements such as LED devices.

The (or each) boundary source may be arranged in any suitable disposition such as to extend wholly or partially around the respective symbol. Conveniently the source may be disposed along a closed circular path but other path shapes are also possible as also are part-circular and other part-closed shapes.

Any suitable colour arrangement may be used for the (or each) boundary source. Colour variation may be achieved in any suitable manner including use of colour-controllable devices such as LEDs, and/or

changeable colour filters, and/or differently coloured individual lighting elements which can be selectively actuated.

Conveniently, tricolour LEDs capable of operation to provide amber, green or red light are used.

5       The (or each) boundary source may be operable to give special lighting effects in addition to colour variation, as desired. Thus for example the source, or individual elements of the source may be capable of being switched on or off, or varied in intensity to produce simulated rotation or other movement or flashing or the like.

10       The (or each) boundary source may extend (partially or wholly) around multiple paths of the same or different dispositions which may lie within each other, such as concentric circles, or which may intersect each other, as desired. These different paths may be individually operable to give desired lighting effects.

15       The illumination device of the invention may be in the form of a light box having an open-topped box-shaped receptacle for the (or each) boundary source and an associated backlight source as mentioned above. The backlight source may be located within the box-shaped receptacle to direct illumination centrally of the open top, and the boundary source may  
20       be disposed at the open top around the periphery thereof. Conveniently, the boundary source may comprise a ring of LEDs on a printed circuit board having a central aperture.

The illumination device of the invention may also incorporate one or more light sources different from and not used in combination with any boundary source as described above. In particular, there may be one said boundary source for illumination of one symbol possibly combined with one  
5 said backlight source, and one or more backlight sources not combined with any boundary source for illuminating one or more adjacent symbols. Alternatively, there may be multiple boundary sources.

There may be three backlight sources in three connected said box-shaped receptacles which may be disposed in an arcuate configuration for  
10 use in backlighting an arcuate symbol-bearing structure, only a central said receptacle also having said boundary source.

The light-transmitting symbol-bearing structure may comprise a transparent or translucent structure, such as a flexible strip or sheet, with symbols applied thereto by printing or in any other suitable manner. The  
15 symbols may be multicoloured and patterned as desired.

Most preferably, the symbol-bearing structure has a separate region around the (or each) symbol which is intended to overlie the (or each) boundary source to coact therewith and provide an enhanced visual effect when the source is actuated. Thus, for example the region may be a  
20 translucent region which incorporates a dispersive pattern or elements e.g. to give a sparkle effect when illuminated. The region may be a ring-shaped region or of any suitable closed or part-closed shape depending on the

disposition of the boundary source.

Most preferably, the illumination device of the invention is for use with a symbol-bearing structure which is arranged to be movable relative to the (or each) boundary source, so as to bring successive symbols on the structure successively into alignment with the (or each) boundary source.

Thus the symbol bearing structure may be a structure, such as a band, at the periphery of a rotatable reel, particularly a reel of a 'fruit' or 'poker' machine as described above in which the reel rotates and comes to rest to display one or more selected symbols. In this case, the possible number of selections can be increased by also selecting the colour of the (or each) boundary source from the range of available colours. Where multiple, typically three or four, reels are used side by side to select combinations of symbols at one or more win lines in a window, the possible number of combinations can be increased by also selecting the colours of the boundary sources. The result may be such that an award corresponding to a selected winning symbol or combination of symbols is enhanced (e.g. doubled or tripled) in dependence on the boundary source colour.

In accordance with a second aspect of the invention there is provided symbol display equipment comprising an illumination device and at least one structure bearing multiple symbols and which can be moved relatively to the device and arrested to bring at least one selected symbol into alignment with the illumination device to be illuminated thereby, characterised in that



the illumination device has at least one light source operable to provide illumination along at least one path across or adjacent to the respective selected symbol. Preferably this light source is the boundary light source as described above.

5           In accordance with third aspect of the invention there is provided symbol display equipment comprising an illumination device and at least one structure bearing multiple symbols and which can be moved relatively to the device and arrested to bring at least one selected symbol into alignment with the illumination device to be illuminated thereby, characterised in that  
10   the illumination device has a main light source arranged to effect illumination of the selected symbol and a supplementary colour-variable light source.       Preferably the colour variable light source is the boundary light source as described above.

15           The second and third aspects of the invention may be used in combination with each other and with the first aspect of the invention.

          The illumination device of the various aspects of the invention may be used with appropriate control circuitry to control switching of the (or each) light source. In the case of a main light source, such as the described backlight source, and a secondary light source, such as the boundary  
20   source, these are preferably independently operable such that for example, the backlight source is permanently illuminated but the secondary source is only illuminated on occasions on a regular or random or other basis.

The invention will now be described further by way of example only and with reference to the accompanying drawings in which:-

Figure 1 is a perspective view of a fruit machine reel shown with part of a reel band and incorporating one form of a light box in accordance with the present invention; and

Figure 2 is an enlarged perspective view of the light box of Figure 1.

Referring to Figure 1, this shows a reel for a 'fruit' or poker machine.

The reel has a skeletal drum-shaped structure 1 fixed by radial spars 2 to a central hub 3, formed integrally as a plastics moulding.

The hub 3 contains a stepper motor (not shown) by means of which the reel can be mounted and rotatably driven.

Around the outer periphery of the drum structure there is attached a translucent flexible plastics band 4 printed with symbols 5 at equally spaced positions. The symbols 5 may be of the kind conventionally used such as fruit symbols, the number 7, bells, bars, etc. These symbols 5 are coloured or multicoloured so as to emphasise their differences and to provide an attractive appearance. There may be say 20 symbols 5 and these may be of several different kinds, whereby certain symbols are repeated, in a predetermined sequence.

The symbols 5 are all bounded by printed translucent rings 6 which incorporate 'sparkle' elements or patterns.

Within the confines of the drum structure 1 there is mounted a light

box 6. The box is mounted on an adjacent fixed structure (not shown) so that the reel is rotatable relative to the light box.

5 The light box 6 comprises an elongate arcuate structure essentially in the form of an open-topped trough 7 with two internal walls 8 which separate the trough into three similar open-topped box-shaped receptacles 9, 10, 11 which are disposed side-by-side longitudinally of the structure 6.

10 Each receptacle 9-11, is tapered away from the open top and has a substantially coplanar rim around the open top. Collectively, the rims of the respective receptacles 9-11 are substantially coplanar with each other and have a concave curvature essentially identical to that of the inner periphery of the drum structure 1. The light box 6 is mounted such that the curved coplanar rims are very close to, but slightly spaced from, the inner periphery of the drum structure 1.

15 At the base of each box 9-11 there is mounted a respective white-light lamp 12 which is directed centrally of the box and the open top thereof. Each lamp 12 is inserted through a central hole in the box base and engages a respective lamp holder 13.

20 The central box 10 differs from the two outer boxes 9, 11 in that it has a cut out 14 in one side wall, it has recessed peripheries 15 adjacent to this cut out 14, and it has an outwardly deflected central channel part 16 at the opposite side wall.

This channel part 16 is used to mount the light box as mentioned above.

5 A printed circuit board 17 is mounted over the top of the central light box 10. The board 17 is rectangular with a central aperture 18. The board is mounted within the confines of the walls 8 and is seated within the recesses 15 so that the board is substantially level with the coplanar rims of the boxes 9-11.

10 Tri-colour LEDs 19 are mounted on the top of the board 17 in a ring around the aperture 18. The LEDs have connections 20 beneath the board 17 which are accessible through the cut out 14. The LEDs can be operated to produce amber, green or red illumination selectively.

15 The reel is used in a 'fruit' or poker machine generally in conventional manner. That is, the reel is mounted within a machine cabinet with two or three like reels so that all reels are rotatable about a common horizontal axis by operation of the respective stepper motors.

20 The reels can be brought to rest after different random periods of time so that three adjacent symbols 5 of each reel are displayed through a window defined as an area of transparency in a glass panel of the machine, with the central symbol 5 of the three symbols aligned with a central horizontal win line and the other two symbols displayed respectively above and below.

The combination of three (or four) symbols 5 from the three (or four)

reels on the win line is assessed to determine whether this is a predetermined winning combination and if so an appropriate award procedure is initiated.

5 For each reel, the three white-light lamps 12 are permanently operated by the control circuitry of the machine so that the selected three symbols 5 are illuminated within the window.

10 The ring of LEDs 19 may also be illuminated so as to produce a ring of light around the periphery of the central symbol 5 which is on the win line. This ring of light coincides at least generally with the respective printed translucent ring 5a around the symbol 5 so as to produce a sparkle effect as well as defining a coloured ring of illumination.

15 The operation of the LEDs 19 for each reel is such as to produce a colourful light display. It may also be associated with winning combination selection. That is, an award procedure, or an enhancement of an existing award procedure, may be initiated in correspondence with the operation of the LEDs 19.

20 By way of example, in the case where the combination of symbols 5 for the three or four reels on the win line is a winning combination, the award value may be varied in dependence on the LED colour. Amber may correspond to normal payout, green for double and red for triple.

Thus, the LEDs 19 may be illuminated each time as the reels come to rest, and all LEDs for all reels may be illuminated with the same selected

colour as selected on a random, or pseudo random or other basis as desired.

The LEDs 19 when illuminated may flash, or light independently e.g. to simulate movement, or may be constant, as desired.

5           In addition to providing a decorative display and providing an additional or enhanced winning combination, the LEDs 19 provide a ring of illumination around the selected symbol 5 to help define the symbol which is selected on the win line irrespective of any misalignment. Thus, in the case where there is some error in setting up of the reels such that the  
10           symbols are not precisely aligned with the win line on stopping, the ring of illumination will help identify the symbol which is nearest to the win line.

          Thus, the light box provides attractive illumination which is independent of, and does not interfere with the illumination of the coloured symbols themselves, it provides further opportunities for winning  
15           combinations, and it assists in defining the selected symbol on the win line.

          It is of course to be understood that the invention is not intended to be restricted to the details of the above embodiment which are described by way of example only. In particular, the LEDs 19 can be illuminated other than as described. For example they can be illuminated on a different basis  
20           for each reel, they need not be illuminated on each occasion, etc. Also, instead of using one complete ring of LEDs there may be a part ring or other shape which may extend part or wholly around the symbol or which may

extend in a path across or otherwise identify the respective symbol additionally to the backlighting thereof by the white-light lamp 12. Moreover, all boxes 9-11 may have LEDs 19, rather than solely the central box 10, and this can be of use e.g. in the case where diagonal or other win  
5 lines are provided additionally to or instead of the central horizontal win line. The light box can also be used on a single or double selector reel, such as is conventionally used in a fruit or poker machine for selection of a numerical value or other symbol on a so-called feature game.

The pcb 17 need not have a cut out 18 for the exposure of the  
10 respective lamp 12. Instead, it is possible to use a pcb which is transparent or translucent (or has a transparent or translucent section) e.g. being formed from a thin, translucent material, or otherwise has a light-transmitting section preferably at least centrally thereof.

The light boxes 9, 10, 11 may be of different shape from those  
15 shown in the drawings and may be mounted in any suitable manner, usually although not necessarily for illuminating 3 symbols. The cut out 14 and the channel 16 need not be provided or arranged in the manner shown.

The invention is preferably although not exclusively applicable to  
20 coin-operated entertainment machines of the 'fruit' or 'poker' kind having a main display device for displaying a selected combination of symbols at a win zone. As used, herein, the term coin-operated is intended also to cover operation by tokens, charge or credit cards or any other means of

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supplying credit or monetary value.



CLAIMS

1. An illumination device for symbol display equipment comprising at least one source of illumination arranged to be mounted behind a light-transmitting structure bearing at least one symbol to provide back-illumination therefor, characterised in that at least one said source of illumination comprises a colour-variable boundary illumination source to provide back illumination at least partially around the periphery of at least one said symbol.
2. A device according to claim 1 wherein the (or each) boundary source is provided in combination with a backlight illumination source.
3. A device according to claim 2 wherein the backlight source is a white light lamp.
4. A device according to claim 2 or 3 wherein the boundary source extends around at least a part of the periphery of the zone of illumination of the backlight zone.
5. A device according to any one of claims 1 to 4 wherein the boundary source is arranged to extend along at least one path wholly around the respective symbol.
6. A device according to claim 5 wherein the path is a closed circular path.
7. A device according to any one of claims 1 to 6 wherein the boundary source is formed from a plurality of individual lighting elements.

8. A device according to claim 7 wherein the lighting elements are LEDs.
9. A device according to claim 7 or 8 wherein the lighting elements are colour-controllable.
10. A device according to claim 8 and 9 wherein the colour controllable lighting elements are tri-colour LEDs.
11. A device according to any one of claims 1 to 10 wherein the boundary source is switchable or variable to give lighting effects.
12. A device according to claim 2 to any claim dependent on claim 2 comprising a light box having an open-topped box-shaped receptacle for the (or each) boundary source and an associated backlight source.
13. A device according to claim 12 wherein the backlight source is located with the open-topped box-shaped receptacle to direct illumination centrally of the open top.
14. A device according to claim 13 wherein the boundary source is disposed at the open top around the periphery thereof.
15. A device according to claim 14 wherein the boundary source comprises a ring of LEDs on a printed circuit board having a central light-transmitting section.
16. A device according to any one of claims 12-15 wherein there are three connected said box-shaped receptacles each with a respective backlight source and at least one with a said boundary source.
17. A device according to claim 16 wherein there is a said boundary

source only in a central said receptacle.

18. A device according to claim 16 or 17 wherein the three receptacles are arranged in arcuate configurations.

5 19. Symbol display equipment comprising an illumination device and at least one structure bearing multiple symbols and which can be moved relatively to the device and arrested to bring at least one selected symbol into alignment with the illumination device to be illuminated thereby, characterised in that the illumination device has at least one light source operable to provide illumination along at least one path  
10 across or adjacent to the respective selected symbol.

20. Equipment according to claim 19 wherein the illumination device is as claimed in any one of claims 1 to 19, the said light source being the said boundary light source.

15 21. Equipment according to claim 19 or 20 wherein said symbol-bearing structure comprises a translucent or transparent band with the symbols applied thereto.

22. Equipment according to claim 21 wherein the band has a separate region around at least one said symbol arranged to overlie at least one said boundary source.

20 23. Equipment according to claim 22 wherein the said separate region is a ring-shaped region.

24. Equipment according to claim 22 or 23 wherein the said separate

region incorporates a light-dispersing pattern or elements to give a sparkle effect when illuminated.

5 25. Equipment according to any one of claims 19 to 24 wherein the symbol-bearing structure is arranged to be movable relative to the (or each) boundary source.

26. Equipment according to claim 25 wherein the symbol-bearing structure is provided at the periphery of a rotatable reel.

10 27. Symbol display equipment comprising an illumination device and at least one structure bearing multiple symbols and which can be moved relatively to the device and arrested to bring at least one selected symbol into alignment with the illumination device to be illuminated thereby, characterised in that the illumination device has a main light source arranged to effect illumination of the selected symbol and a supplementary colour-variable light source.

15 28. Symbol display equipment according to claim 27 which is equipment according to any one of claims 19, 21-27, the illumination device being as claimed in any one of claims 1-19, and the said light source being the said boundary light source.

20 29. A player-operable entertainment machine incorporating equipment according to any one of claims 19-28.

30. A player-operable entertainment machine according to claim 29 which is a coin-operated machine of the 'fruit' or 'poker' kind.



INVESTOR IN PEOPLE

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Application No: GB 0114876.6  
Claims searched: 1-18

Examiner: Robert Barrell  
Date of search: 5 November 2001

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:  
UK Cl (Ed.S): G4V (VAA)  
Int Cl (Ed.7): G07F 17/32 & 17/34; A63F 5/04  
Other: ONLINE: EPODOC, WPI & JAPIO

### Documents considered to be relevant:

| Category | Identity of document and relevant passage                   | Relevant to claims        |
|----------|---|---------------------------|
| Y        | GB 2336233 A (ASTRA) - page 2                               | 1-4, 7-13 & 16            |
| X, Y     | GB 2334363 A (BWB) - Fig 3, page 3 line 13-16 & pages 6 & 7 | X: 1<br>Y: 1-4, 7-13 & 16 |
| Y        | EP 0992959 A (ARUZE) - para 0032 & 0038.                    | 10                        |
| A        | JP 2001104540 A (SAMI) - abstract                           |                           |
| Y        | JP 2000061033 A (TAKASAGO) - para. 0116 & figs 2-4.         | 1-4, 7-9, 11-13 & 16-18.  |
| Y        | JP 010052533 A (SANKYO) - abstract and figs 3 & 4.          | 1-4, 7-9, 11-14 & 16-18   |

|   |   |   |  |
|---|---|---|--|
| X | Document indicating lack of novelty or inventive step   | A | Document indicating technological background and/or state of the art.  |
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